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Analytics in Healthcare

Preparing for advance healthcare analytics

2015

Connect

With Real Innovation

Connected Health

- From devices to data to patients and caregivers through to data analysis that addresses actionable insight, you need an infrastructure to enable connected health

- Hitachi's vision of Social Innovation through Big Data is to connect a healthcare organization's Information and operational technology and deliver innovative solutions that advance our society

- Removing the barriers to ubiquitous data access by health organizations is only the first step. Driving towards population health management is the end goal through evidence based medicine and personalized health methodologies.
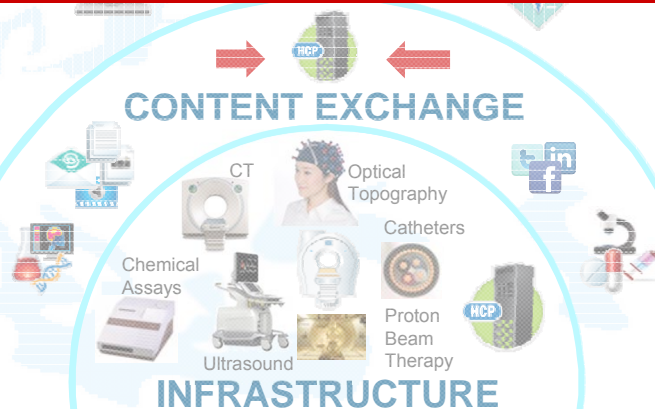
"WHAT IF EVERY DIGITAL SURFACE WAS CONNECTED?"

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SOCIAL INNOVATION
IT'S OUR FUTURE

The Patient Care Continuum

- You need to be able to engage the entire care pathway
- Tracking a patient through diagnosis and treatment of disease:

DESIGN, SOURCE, IMPLEMENTATION, PROJECT MANAGEMENT, INTEGRATION, STRATEGIC PLANNING, SUPPORT

BLOOD ANALYSIS	DIAGNOSTIC IMAGING	CELLULAR ANALYSIS	DATA MANAGEMENT	SENSORS, MONITORS	TREATMENT & THERAPY
BLOOD ANALYZER	CATHETERS COMPUTED MAGNETIC TOMOGRAPHY RESONANCE ULTRASOUND	ELECTRON MICROSCOPE GENOMIC SEQUENCE	COMPUTE VIRTUALIZATION OBJECT ENTERPRISE STORAGE STORAGE	HUMIDITY SENSORS MONITORS	PROTON BEAM THERAPY

Identify compounds in blood that may indicate disease

Exam biopsy sample
Sequence DNA

Monitor conditions to ensure optimum environment; patient safety

Intravascular imaging of heart
Ultrasound liver for possible metastases
CT of lung for masses
MR for finer detail of soft tissue

Compute 3D imaging of tumors
Store and manage images
Enable access to digital data by relevant caregivers

Treat identified tumor

"Infrastructure is the foundation upon which to build a connected enterprise"
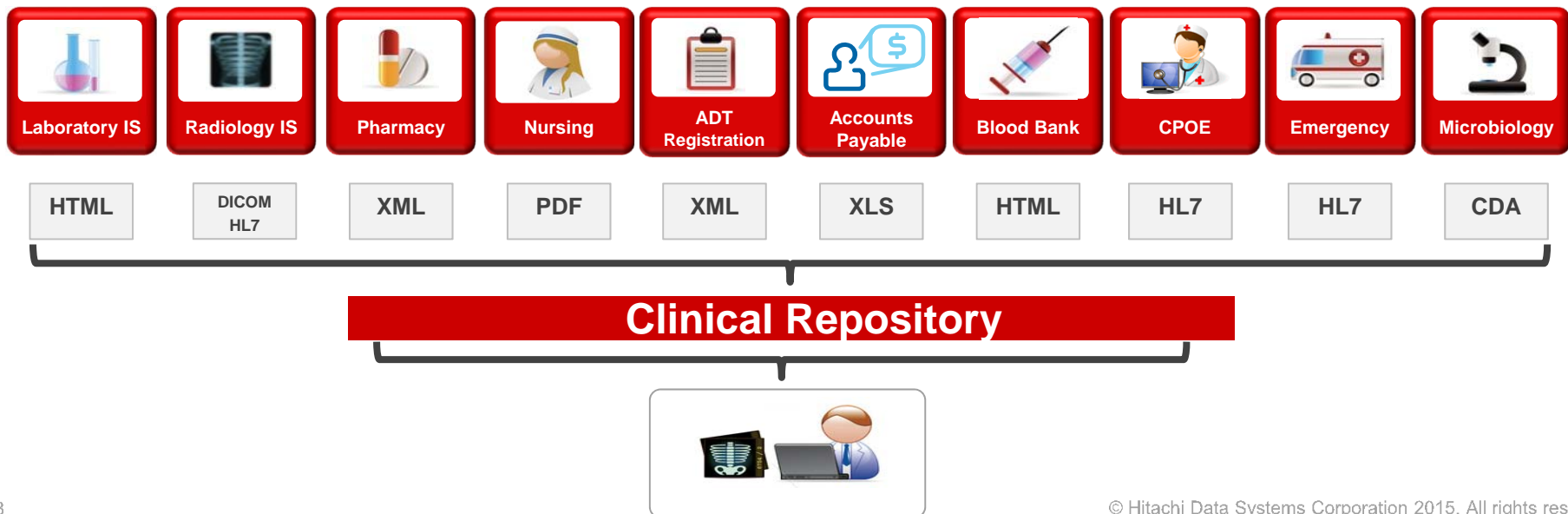
The Next Generation Patient Data Repository

- Unstructured content volumes are exploding

- The need to store, manage and access many types of unstructured content in the course of care delivery, including but not limited to medical images, still photographs, video and audio recordings and free text reports and notes is growing

- There is an unmet need for an unstructured content repository for the enterprise, storing all types of unstructured content in a patient-centric manner that makes it available to both clinical and image management systems.

- There is a need to unite related unstructured content captured in other systems with the patient-centric information being captured in the electronic health record (EHR) to form a longitudinal record of unstructured content associated with the patient's medical treatment

Connected Health Solutions

- Aggregation of different data sources, formats and applications
- Metadata indexing for searching the patient longitudinal record
- Standards based, workflow enablement
- Highly scalable, application independent, long term repository
- Foundation for information analysis

| Laboratory IS	Radiology IS	Pharmacy	Nursing	ADT Registration	Accounts Payable	Blood Bank	CPOE	Emergency	Microbiology
HTML	DICOM HL7	XML	PDF	XML	XLS	HTML	HL7	HL7	CDA

Clinical Repository

Key Points

- Data is being generated from numerous types of devices, applications, locations and stakeholders

    - Wearable devices, medical imaging, chemical assays…

- Managing this data is key to enabling a connected health enterprise

- Adding analysis to this data brings further value and enhances decision making

Create a Connected Health Ecosystem
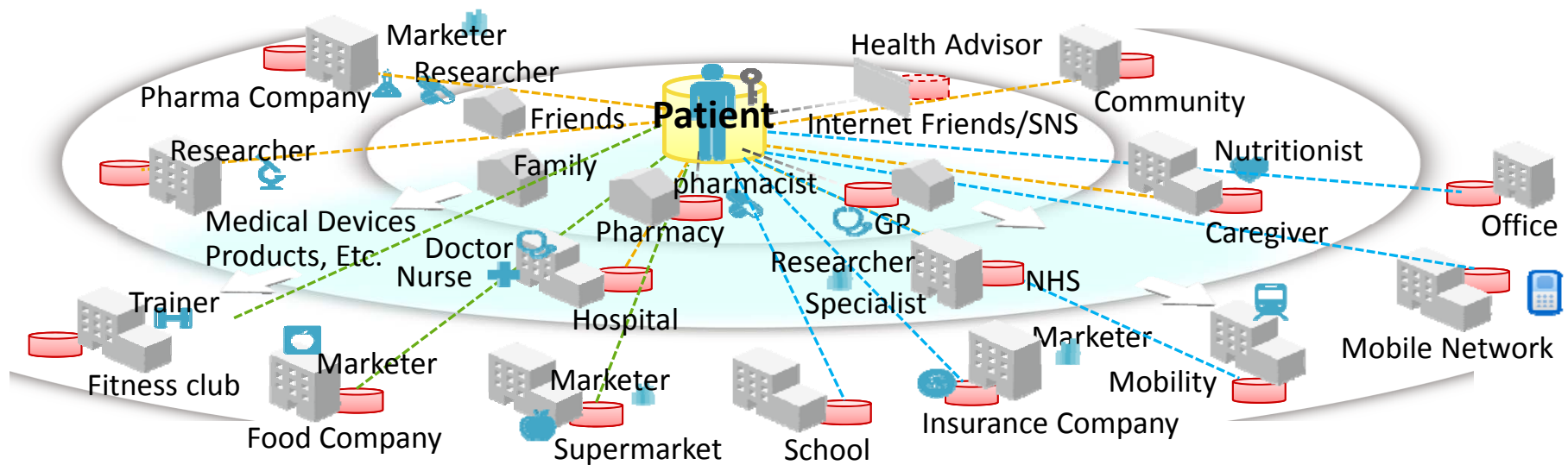
Improve patients quality of life by leveraging their healthcare related data
Expand the outreach to the complete continuum of caregivers

The Four Types of Analytics

MORE THAN 90% OF COMPANIES TODAY USE VERY BASIC ANALYTICS - WHAT WE CALL "DESCRIPTIVE ANALYTICS."

Descriptive Analytics: This is what you get from your web server through tools like Google Analytics, Omniture or the like. You can quickly understand **"what happened"** during a given period in the past and verify if a campaign was successful or not based on simple parameters like page views. About 35% of companies surveyed say they do this consistently.

Diagnostic Analytics: If you want to go deeper into the data you have collected from users in order to understand **"Why some things happened,"** you can use business intelligence tools to get some insights. However, it is very laborious work that has limited ability to give you actionable insights. It basically provides a very good understanding of a limited piece of the problem you want to solve. Usually less than 10% of companies surveyed do this on occasion and less than 5% do so consistently.

Predictive Analytics: If you can collect contextual data and correlate it with other user behavior datasets, as well as expand user data beyond what you can get from your web servers, you enter a whole new area where you can get real insights. Essentially, you can predict **what will happen** if you keep things as they are. However, less than 1% of companies surveyed have tried this yet. The ones who have, found incredible results that have already made a big difference in their business.

Prescriptive Analytics: Once you get to the point where you can consistently analyze your data to predict what's going to happen, you are very close to being able to understand **what you should do** in order to maximize good outcomes and also prevent potentially bad outcomes. This is on the edge of innovation today, but it's attainable!

What Are the Advantages of this type of Technology?

- *Data Integration*: All big data applications start with a requirement for data capture and integration. This is the core strength of Pentaho. Pentaho has a broad set of data connectors and a visual development environment for streamlined development of new connectors to any data source. They have built-in capabilities for data cleansing, enriching with metadata, and blending different sources such as social sentiment data with CRM data.

- *Data Discovery:* Pentaho empowers business users and analysts to easily visualize, analyze, and report on data across multiple dimensions without depending on IT or developers. Information-driven decisions can happen anywhere with compelling dashboards and visualizations that will run on any device, such as mobile phone, laptop, or on the Web.

- *Predictive Analytics:* Though Pentaho does not develop analytic algorithms and tools themselves, they have licensed an industry-leading, predictive analytics open source library called Weka. This library includes a rich portfolio of machine learning and data mining algorithms. These algorithms are embeddable into big data workflows. Pentaho is the key contributor to the Weka open source project having made about 80% of the contributions.

7 BI Trends in the Healthcare Industry

1. Consolidation of information
   - Bringing financial, patient & clinical data together
2. New data resources available to leverage with analytics
   - National health DBs, shared data w insurers, etc...
3. Need for self-service data discovery tools
   - Data is new, analytics is new
4. Ease of use for non-technical users
   - Doctors & nurses are not the most technical and can't spend hours on training or looking into some report
5. Users are mobile
6. Professionalisation through metrics & KPIs
   - Seeing the patient as a customer
7. Big Data analytics on large and varied data sets

Big Data in Healthcare

- Bigger challenge is data variety
- Monitor and manage growing volumes of data for compliance
- Must leverage all data sets for predictive, pattern & risk analysis
- Need to analyze patient behaviour to optimise processes, reduce re-admissions and provide better care

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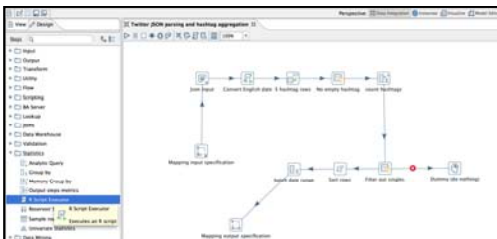**Inspire the Next**

Pentaho Analyzer

Pentaho Enterprise and
Interactive Reports
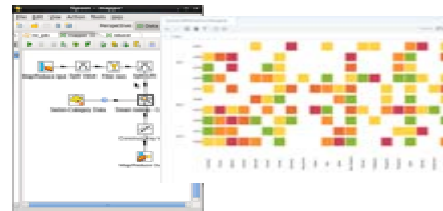

Pentaho Dashboards

Pentaho Data Integration

Pentaho for
Big Data MapReduce

Pentaho Data Mining /
Predictive Analytics

Comprehensive Big Data Analytics

Data Ingestion,
Integration,
Process

Enterprise &
Ad Hoc Reporting

Data Discovery
Visualization

Predictive
Analytics

Big Data Analytics

Hadoop	NoSQL	Analytic	Relational
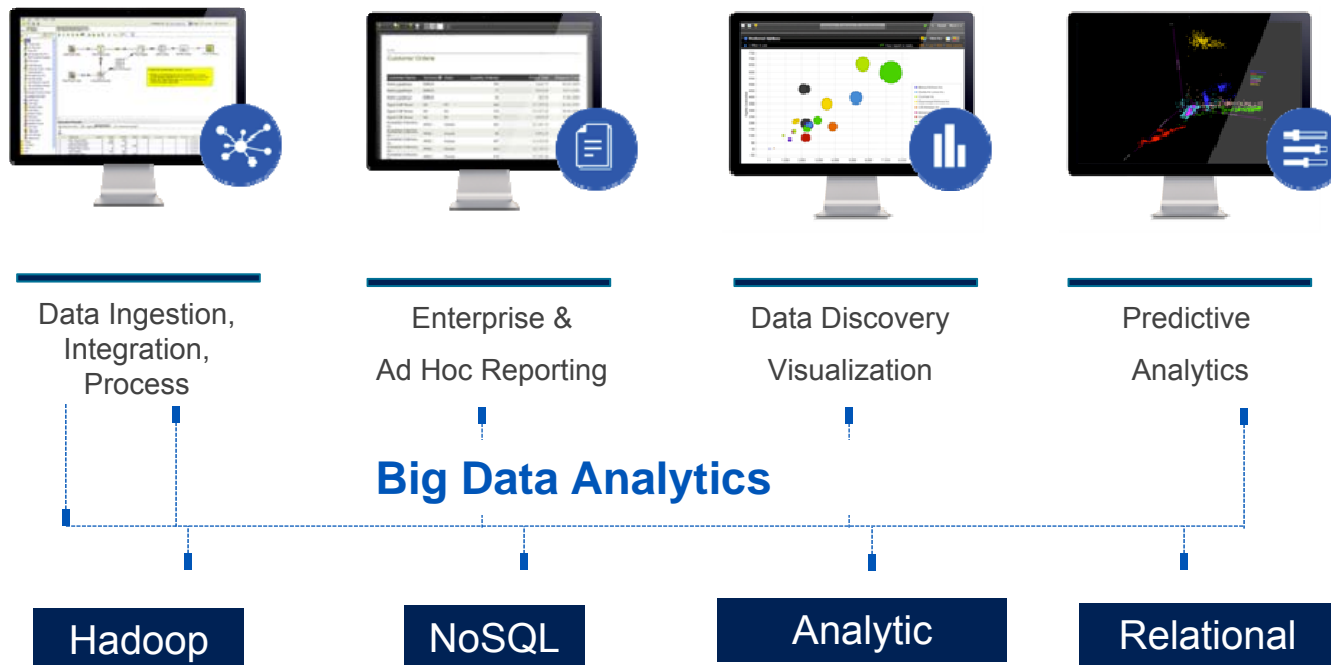
Pentaho Use Cases

Clinical Excellence
- Improve Operational Efficiency
- Eliminate costly, manual and delayed report generation
- Behavioural analysis
- Pattern & risk analysis

st ANTONIUS

Nurses
Analyzing patient waiting times

Improving Patient Satisfaction
- Outcome of care analysis
- Clinical service excellence through access to information for better decisions
- Sharing of patient information through the treatment lifecycle
- Reduce Patient waiting times

NHS

Predictive Healthcare Analyst
Preventive medical treatment for high risk patients

Compliance
- Avoid fines / litigation
- Maximise available public funding
- Provide Social and Public Information
- Fraud detection and prevention

ShareableInk
IMMEDIATE. ACTIONABLE. EFFORTLESS.

Doctors & Nurses
Better patient care, compliance & cost metrics through analysis of big data streams of clinical data

Financial Management
- Resource & staff planning
- Optimise supply chain
- Understand patients/procedures/revenue
- Manage claims & reimbursements

STONEGATE
REDEFINING ADULT LIVING

Finance Analyst
Full financial performance visibility for each facility to optimize operational costs

Pentaho Analytics at StoneGate Senior Living
Assisted Living Provider

> "Although StoneGate is a medium-sized company, our Pentaho-driven expense management system gives us the resources to compete with the huge players in our space."
>
> Brandon Jackson, Director of Analytics and Finance, StoneGate Senior Living

Business Challenges

Wanted to automate data collection, analysis and visualization from six different businesses in 41 of its senior living facilities.

Pentaho Benefits

- Major cost savings: Integrating billing transaction data resulted in cumulative savings of $109,000 in 2.5 years. Cut overtime in half saving $264,000 a year; Avoided potential Medicare fines of $300,000 each.
- Competitive advantage for a midsize company to access resources to refine operations such as mobile and predictive analytics and comprehensive data integration.

Why Pentaho

- Standards driven
- Technical innovation
- Cost of ownership
- Involved product engineers, professional support and training.

Pentaho Business Analytics at Specsavers
Leading optical retailer in the UK and top five in the world

> "With Pentaho Business Analytics we can now analyze these cross-sales patterns, which inform our marketing campaigns, procurement planning and other processes."
>
> --Carl Jansen, IT Product Development Manager at Specsavers

Business Challenge

Specsavers needed faster, more consistent reporting for inventory planning, materials sourcing and retail promotion planning, particularly for its famous two-for-one eyeglass deals.

Pentaho Benefits

- Office managers now receive monthly reports in a single, standardized format.
- Less reliance on IT with "super user" data analysts being trained on Pentaho, freeing up IT resources for back end development.
- Pentaho Business Analytics applications successfully rolled out in test markets to 25 head office managers and approximately 200 planners in the warehouses and labs.

Why Pentaho

- Breadth of business analytics capabilities including data integration.
- Commercial open source technology.
- Self-service features.

Pentaho Analytics at Bedlam Alliance for Community Health at the University of Oklahoma School of Community Medicine in Tulsa

The University of Oklahoma®
TULSA
SCHUSTERMAN CENTER

> "We are moving from taking care of patients in an office to looking at an entire panel of patients and caring for them wherever they are. With Pentaho, we can see which patients are moving toward therapeutic targets and which are not and call those individuals into the clinic as needed."
>
> - Dr. Ronald Saizow, Professor of Medicine, Associate Dean of Academic Programs, University of Oklahoma School of Community Medicine

Business Challenge

Bedlam needed a business analytics platform to allow professors and students to track patient care efforts, take a closer look at the effects of their treatment, and create reports to provide patients with top-notch preventive care for the future.

Pentaho Benefits

- Enabled students to see patient's vital statistics, such as blood sugar, blood pressure and cholesterol
- Has provided an evidence-based treatment protocol to provide more aggressive treatments for patients
- Students are able to view and analyze data from an entire panel of patients to provide consistent and preventive care without the requiring patients to be present
- Now better able to move patients toward their target therapeutic goal

Why Pentaho

- Creates clear, readable and accurate data

- Provides vision into treatment results

Pentaho Analytics at Cardiac Science
Global Leader in Cardiology Products

CARDIAC science

> *"Pentaho provides the same or better functionality and more support versus the competition. They provide a lower cost of ownership versus proprietary systems. We've been very happy with Pentaho Data Integration Enterprise Edition. "*
>
> – Debbie Shapiro, Data Warehouse Manager, Cardiac Science

Business Challenge

With customers in over 100 countries and a rapidly growing production database, Cardiac Science needed timely and accurate business information to make key decisions for marketing sales, accounting and engineering quality.

Pentaho Benefits

- Able to obtain an automated, nightly archival of production system
- Improved customer experience teams able to quickly and easily access and analyze data concerning service request and incidents
- Intuitive drag and drop design environment made it easy for administrators to define and maintain data extraction jobs and metadata-driven engine addresses complex integration routines without having to write code
- Professional support and vibrant community helped accelerate deployment while minimizing risk and cost

Why Pentaho

- Selected over Informatica and Microsoft because of functionality and support
- Ease-of-use
- Rich feature set

Pentaho Analytics at Delta Dental
Leading dental insurance provider

△ DELTA DENTAL®

> *"Once we had a business analytics platform that everyone could use and people understood its capabilities, they were transformed into knowledge workers who can look to data to answer their questions. As a result, people rely on data, not anecdotes to drive the business "*
>
> - John Sheffield, Director of Software Development, at Delta Dental of Virginia

Business Challenge

Needed to replace proprietary BI system, empower self-service analytics and enable the IT team to scale and be flexible with the company's rapid growth

Pentaho Benefits

- Competitive advantage to compete and win against other, often larger, carriers
- Pentaho has precipitated a cultural shift at Delta Dental of Virginia resulting in **more than 35,000 agents** relying on data, not anecdotes to drive the business
- Proliferated success companywide resulting in other Delta Dental member companies either license the software or utilize it through SaaS

Why Pentaho

- High value
- Easy to integrate
- Cost efficient
- User friendly

Pentaho Analytics at St. Antonius Hospital
Clinical training hospital in the Netherlands

ZIEKENHUIS
ST ANTONIUS

"With interactive analysis, our doctors, nurses, and administrative staff can now improve the utilization of emergency and surgery rooms to deliver better patient care and quality services."

--Gerrit Krediet, CTO, St. Antonius Hospital

Business Challenge

Wanted the entire staff to leverage hospital data to identify trends, pinpoint problems and make recommendations to streamline hospital processes.

Pentaho Benefits

- Enabled St. Antonius to instill a culture of self-service BI throughout the hospital.
- Reduced emergency room turnaround times (20%) and streamlined operating room processes.
- Put more intelligence into the hands of doctors and administrators and consequently freed up the IT staff for other work.

Why Pentaho

- Needed to leverage HL7 standards.
- Open platform
- End-to-end platform
- Mobile BI capabilities

Pentaho Analytics at Leaders in Oncology
Europe's top cancer treatment facility

> "We ask our clinical staff to enter a lot of assessment data and we want them to see the results of their work. We believe our staff should benefit from business analytics and Pentaho will make this happen."
>
> --Steve Rumbles, Head of IT, Leaders in Oncology

Business Challenge

Needed to access and analyze massive amounts of complex data generated by patients during treatment such as diagnoses, stage of disease, demographic profiling, blood test results and chemotherapy regimens.

Pentaho Benefits

- Ability to glen basic information on company information, treatment types and diagnoses to help inform senior management and the board.
- Provide clinical staff on the front line with up to the minute reports to provide insight into the recovery prospects of patients.
- Creation of monthly clinical outcome reports based on the standard International Classification of Diseases (ICD), using Common Toxicity Criteria (CTC) standards for disease staging and treatment plan scoring formats.

Why Pentaho

- Cost of ownership
- Scalability
- Does not charge per user
- Selected over Business Objects

Pentaho Analytics at Loma Linda
Educational health-sciences institution

LOMA LINDA UNIVERSITY
HEALTH CARE

> "Because Pentaho is so accessible to users, it has quickly spread to different groups and new users. Some users want data in a cube; others just want output or static data for a mailing. Regardless, users know that they can basically get anything they want, quickly and easily, because of Pentaho's capabilities. "
> --Duncan Henry, Analyst, Loma Linda University Health Care

Business Challenge

As a health care center with over 500,000 patients and 600 doctors, Loma Linda sought to update excel users with OLAP analysis to support data integration and analysis across multiple sources to gain better insight into patient and business information.

Pentaho Benefits

- Ability to drill down and analyze to the individual patient level
- Centralized, secured, consistent information delivery
- Comprehensive analysis of time periods, services provided, billing groups, physicians

Why Pentaho

- HIPPA compliant
- Open standards
- Ease of Integration
- Cost of Ownership

Pentaho Embedded Analytics at Intelligent Insites
Software provider helping hospitals improve patient satisfaction and operational performance

IntelligentInSites

> "Our partnership with Pentaho is helping us supercharge hospitals' real-time location systems and RFID solutions, thereby improving overall healthcare, one optimized process at a time."
>
> - Carol Tweten, director of Product Management, Intelligent InSites

Business Challenge

Intelligent Insites wanted to embed an analytics platform to help automate RTLS data analysis and provide enhanced business intelligence tools for healthcare providers.

Pentaho Benefits

- Hospitals can now perform extensive analysis on their RTLS and RFID data, uncover trends and gain actionable intelligence.
- Pentaho helps hospitals analyze processes, identify operational bottlenecks, shorten patients' length of stay, and improve patient safety and patient satisfaction.

Why Pentaho

- Ease of integration
- Superior end-to-end analytics platform

Hitachi Data Systems

Thank you